IN THE CLAIMS:

1. A sheet of material formed for bending along a bend line comprising:

a sheet of material having a plurality of slits formed therethrough, the slits being positioned relative to a desired bend line and configured to produce bending of the sheet of material along the bend line with edge-to-face engagement of the sheet of material on opposite sides of the slits during substantially the entire bend of the sheet of material.

2. The sheet of material as defined in claim 1 wherein,

the sheet of material is formed with at least two elongated slits positioned proximate the bend line in longitudinally displaced positions relative to each other along the bend line, each slit having a slit end portion with a pair of adjacent slit end portions on opposite sides of the bend line defining a bending strap having a longitudinal strap axis extending across the bend line.

3. The sheet of material as defined in claim 2 wherein,

the slit end portions diverge away from the bend line.

4. The sheet of material as defined in claim 3 wherein,

the slit end portions are arcuate and curve away from the bend line.

5. The sheet of material as defined in claim 2 wherein,

the slits are positioned equidistant and on opposite sides of the bend line, and the slits are positioned in longitudinally overlapping relation to orient a longitudinal strap axis of the bending strap to extend at an oblique angle to the bend line.

6. A sheet of material as defined in claim 1 wherein, the edge-to-face engagement occurs along substantially the full length of the slits during bending of the sheet of material.

7. The sheet of material as defined in claim 1 wherein, the sheet of material is formed with at least two elongated slits positioned proximate and on opposite sides of the bend line in longitudinally staggered positions relative to each other along the bend line, and the slits each have substantially the same configuration, with the slit on one side of the bend line being inverted relative to the slit on the other side of the bend line.

8. The sheet of material as defined in claim 7 wherein, the slits are symmetrical about a central transverse axis.

9. The sheet of material as defined in claim 7 wherein the slits are asymmetrical about a central transverse axis.

10. The sheet of material as defined in claim 1 wherein, the slits each have end portions and the longitudinally adjacent slit end portions define bending straps extending across the bend line that are symmetrical about a longitudinal strap axis.

11. The sheet of material as defined in claim 1 wherein, the slits each have end portions and the longitudinally adjacent slit end portions define bending straps extending across the bend line that are asymmetrical about a central strap axis.

12. The sheet of material as defined in claim 1 wherein, the slits each have substantially the same length along the bend line.

13. The sheet of material as defined in claim 1 wherein, the slits have differing lengths along the bend line.

14. The sheet of material as defined in claim 1 wherein, the slits are provided by a plurality of arcuate slits alternatively positioned on opposite sides of and longitudinally shifted along the bend line, the arcuate slits being convex in a direction facing the bend line and defining bending straps having strap axes extending obliquely across the bend line.

15. The sheet of material as defined in claim 14 wherein, the sheet of material is formed with a plurality of pairs of longitudinally overlapping slits positioned laterally equidistant from the bend line to define the obliquely oriented strap axes.

16. The sheet of material as defined in claim 15 wherein, the strap axes are oblique to the bend line in oppositely inclined directions.

17. The sheet of material as defined in claim 1 wherein, the slits each have end portions, and the longitudinally adjacent slit end portions define bending straps having longitudinal strap axes extending obliquely across the bend line; and

the strap axes are oblique to the bend line in the same direction to produce relative displacement along the bend line of portions of said sheet of material on

opposite sides of the bend line upon bending of the sheet of material.

18. The sheet of material as defined in claim 1 wherein, the slits have a kerf width which is sufficiently small so as to ensure edge-to-face interengagement of the sheet of material on opposite sides of the slits during bending.

19. The sheet of material as defined in claim 1 wherein, the sheet of material is provided by a deformable sheet of one of: a metal, and a plastic.

20. The sheet of material as defined in claim 18 wherein, the sheet of material is provided by a sheet which will only be elastically deformed during bending, and the slits are configured to orient the bending straps at an oblique angle which is sufficiently small to prevent plastic deformation of said sheet of material.

21. The sheet of material as defined in claim 1 wherein, the slits are configured to cause an edge of the sheet of material along one side of the slits to engage and slide along a face of the sheet of material along the other side of the slits during bending.

22. The sheet of material as defined in claim 2 wherein, the slits are formed with a stress reducing configuration at the ends of the slit end portions.

23. The sheet of material as defined in claim 1 wherein, the plurality of slits includes a plurality of slits along and proximate the bend line configured to define at least one bending web between adjacent slit end portions,

at least one slit being comprised of a first pair of longitudinally extending slit segments positioned proximate to and on opposite sides of and substantially parallel to the bend line, the longitudinally extending slit segments further having a pair of longitudinally proximate ends connected by a transversely extending slit segment.

24. The sheet of material as defined in claim 1 wherein, the sheet of material is secured in a coiled condition.

25. The sheet of material as defined in claim 2 wherein, the ratio of a jog distance between slits on opposite sides of the bend line to the thickness of the sheet of material is less than about 1.0, and the slits have a kerf less than about 0.3 times the thickness of the sheet of material.

26. The sheet of material as defined in claim 2 wherein, the longitudinally adjacent ends of the slits define a bending strap extending across the bend line; and the bending strap is formed with a width dimension equal to between about 0.5 to about 4.0 times the thickness of the sheet of material.

27. The sheet of material as defined in claim 26 wherein, the width dimension of the bending strap is between about 0.7 to about 2.5 times the thickness of the sheet of material.

28. The sheet of material as defined in claim 1 wherein, the sheet of material has a plurality of slits positioned along a plurality of bend lines in positions

producing edge-to-face engagement of the sheet material on opposite sides of each of the plurality of bend lines; and

the sheet of material being bent along the plurality of bend lines to produce a three-dimensional structure.

29. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is a box beam.

30. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is a cross-braced box beam.

31. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is a chassis for electrical components.

32. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is a stud wall.

33. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is an origami form.

34. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is a corrugated panel.

35. The sheet of material as defined in claim 28 wherein, the three-dimensional structure is a corrugated column.

36. A sheet of material for bending along a desired bending line comprising:

a sheet of material having a plurality of bending strap-defining structures formed therein, the strap-

defining structures being positioned to define at least one bending strap in the sheet of material having a longitudinal strap axis oriented and positioned to extend across the bend line, and the strap defining structures being configured and positioned to produce bending of the sheet of material along the bend line.

37. The sheet of material as defined in claim 36 wherein, the strap-defining structures are slits formed to extend through the sheet of material.

38. The sheet of material as defined in claim 37 wherein, the slits have a kerf dimension and jog distance causing edge-to-face engagement of the sheet of material on opposite sides of the slits during bending of the sheet of material.

39. The sheet of material as defined in claim 37 wherein, the slits are elongated arcuate slits.

40. The sheet of material as defined in claim 39 wherein, the arcuate slits have convex sides facing the bend line.

41. The sheet of material as defined in claim 36 wherein, the strap-defining structures are grooves formed to a depth not extending through the sheet of material.

42. The sheet of material as defined in claim 41 wherein, the grooves are elongated arcuate grooves.

43. The sheet of material as defined in claim 42 wherein, the arcuate grooves have convex sides facing the bend line.

44. The sheet of material as defined in claim 41 wherein,

the grooves are formed in the same side of the sheet of material.

45. The sheet of material as defined in claim 36 wherein,

the strap-defining structures define straps having a width dimension which increases in both directions along a longitudinal strap axis from about a midpoint of the length of the strap.

46. A sheet of material formed for bending along a bend line comprising:

a sheet of material having a plurality of slits formed therethrough in positions proximate and along the bend line, the slits each having opposite ends which diverge away from the bend line, and the slits being configured and positioned to produce bending of the sheet of material along the bend line.

47. The sheet of material as defined in claim 36 wherein,

the slits are alternatively positioned on opposite sides of the bend line,

longitudinally adjacent slits have slit end portions defining a bending strap with a width dimension which increases as the bending strap extends away from the bend line.

48. The sheet of material as defined in claim 36 wherein,

the slits are each formed with a kerf dimension and a jog distance dimension relative to a thickness dimension of the sheet of material producing edge-to-face engagement of portions of the sheet of material on opposite sides of the slits during bending.

49. A sheet of material formed for precision bending along a bend line comprising:

a plastically and elastically deformable solid sheet of material having a plurality of elongated closed-ended slits therein positioned in end-to-end relation along and proximate to opposite sides of the bend line; and

each slit having slit end portions diverging away from the bend line, with pairs of longitudinally adjacent end portions defining bending straps extending obliquely across the bend line.

50. The sheet of material as defined in claim 49 wherein, the slits are positioned on alternating sides of the bend line and the slit end portions are arcuate and curve away from the bend line to define obliquely oriented straps skewed in alternating directions to the bend line.

51. The sheet of material as defined in claim 49 wherein, the slits are arcuate and have convex side facing the bending line.

52. The sheet of material as defined in claim 49 wherein, the bending strap is oriented for both twisting and bending during bending of the sheet of material.

53. The sheet of material as defined in claim 49 wherein, a width dimension of the bending strap is greater than the thickness dimension of the sheet of material.

54. The sheet of material as defined in claim 49 wherein, the bending strap has a thickness dimension which increases as the bending strap extends away from the bending line.

55. The sheet of material as defined in claim 49 wherein, the plurality of slits define a plurality of bending straps extending across the bending line at oblique angles to the bending line.

56. The sheet of material as defined in claim 55 wherein, alternative bending straps extend across the bending line in opposed skewed directions.

57. The sheet of material as defined in claim 56 wherein, the sheet of material is a sheet of an isotropic material.

58. The sheet of material as defined in claim 55 wherein, a plurality of the bending straps are skewed to extend across the bending line in the same direction.

59. The sheet of material as defined in claim 58 wherein, the sheet of material is a non-isotropic material.

60. The sheet of material as defined in claim 49 wherein, the slits are positioned substantially equidistance on the opposite sides of the bending line to produce bending of the bending strap about a virtual fulcrum substantially superimposed on the bending line, and wherein the transverse distance between slits across the bend line is not greater than about the thickness of the sheet of material.

61. The sheet of material as defined in claim 49 wherein, the slits are formed to cooperate with the bending strap to displace the sheet of material on opposite sides

of the slits out of engagement as the bending of the sheet of material is being completed.

62. The sheet of material as defined in claim 49 wherein,
the sheet of material is a sheet of an anodized metal.

63. The sheet of material as defined in claim 49 wherein,
each slit has arcuate end portions at opposite ends of the slit and the arcuate end portions are formed to curve in a direction away from the bend line.

64. The sheet of material as defined in claim 63 wherein,
the arcuate end portions extend to terminate at least the end of a zone of plastic deformation of the bending strap.

65. The sheet of material as defined in claim 49 wherein,
the sheet of material defining the slits has been outwardly compressed.

66. The sheet of material as defined in claim 49 wherein,
the slits are arcuate in shape and the tongue on the convex side of at least one slit is displaced laterally out of the plane of the sheet of material prior to bending of the sheet of material in order to bias the direction of bending of the sheet of material.

67. The sheet of material as defined in claim 49 and,
one of: a rub, dimple, contour, opening, flange, tab and groove formed in the sheet of material.

68. The sheet of material as defined in claim 49 wherein,

the slits are formed to extend through the sheet of material at an oblique angle to the plane of the sheet of material.

69. The sheet of material as defined in claim 49 wherein, said sheet of material is a sheet of cast material having the slits cast therein.

70. The sheet of material as defined in claim 49 wherein, the sheet of material defining the slits has been at least one of: deburred, electropolished, solvent etched, anodized, treated to reduce corrosion, and electroplated.

71. The sheet of material as defined in claim 49, and an elastomeric layer bonded to the sheet of material across the bend line.

72. The sheet of material as defined in claim 71 wherein, the elastomeric layer is decorated.

73. The sheet of material as defined in claim 71 wherein, the elastomeric layer is reflective.

74. The sheet of material as defined in claim 49 wherein, the sheet of material is a material having a thermally actuated shape memory.

75. The sheet of material as defined in claim 49 wherein, said sheet of material carries an adhesive strip thereon.

76. The sheet of material as defined in claim 49 and, a guard strip of material secured to the sheet of material over the bend line.

77. The sheet of material as defined in claim 76 wherein, the guard strip is secured to a side of the sheet of material away from which the sheet of material is to be bent.

78. The sheet of material as defined in claim 77 wherein, the guard strip is secured to a side of the sheet of material toward which the sheet of material is to be bent.

79. The sheet of material as defined in claim 49 wherein, the sheet of material is formed for bending along a plurality of bend lines each having a plurality of slits therealong configured to produce edge-to-face engagement of the sheet of material on opposite sides of the slits during bending.

80. The sheet of material as defined in claim 79 wherein, the plurality of bend lines are positioned and oriented to enable formation of a hollow closed structure upon bending of the sheet of material.

81. The sheet of material as defined in claim 80 wherein, the plurality of bend lines are positioned and oriented to enable formation of a hollow curved beam upon bending of the sheet of material.

82. The sheet of material as defined in claim 79 wherein, said plurality of bend lines are positioned and oriented to enable formation of a corrugated structure upon bending of the sheet of material.

83. The sheet of material as defined in claim 80 wherein,

the edges of the sheet of material are formed to mate with a curved surface.

84. The sheet of material as defined in claim 83 wherein, the edges of the sheet of material are formed to mate with a cylindrical surface, and the hollow closed structure is a polygonal structure formed by a plurality of planar surfaces of said sheet of material between the plurality of bend lines.

85. The sheet of material as defined in claim 79 wherein, the sheet of material is further formed with a plurality of attachment tabs along the plurality of bend lines.

86. The sheet of material as defined in claim 85 wherein, the attachment tabs include fastener receiving openings therein.

87. The sheet of material as defined in claim 85 wherein, the attachment tabs are formed to extend through attachment slots provided in a second sheet of material to secure the second sheet of material to the first named sheet of material.

88. The sheet of material as defined in claim 79 wherein, the plurality of bend lines are substantially parallel to, and equally spaced from, each other, and the sheet of materials bent to have a zig-zag transverse cross section, and

two substantially planar sheets of material secured to opposite sides of the sheet of material to provide a corrugated assembly of sheets.

89. A hollow beam comprising:

a first sheet of material formed for bending along a plurality of first sheet bend lines, the first sheet of material being formed with a plurality of slits therethrough positioned proximate each of the first sheet bend line, and the slits being configured to produce bending, and the first sheet of material being bent, along the first sheet bend lines;

a second sheet of material formed for bending along a plurality of second sheet bend lines, the second sheet of material being formed with a plurality of slits therethrough positioned proximate each second sheet bend line, and the slits being configured to produce bending, and the second sheet of material being bent, along the second sheet bend tines; and

the first sheet of material and the second sheet of material being secured together to form a hollow beam.

90. The hollow beam as defined in claim 89 wherein,

the slits in the first sheet of material and the slits in the second sheet of material are configured to produce edge-to-face engagement of the material on opposite sides of the slits during bending.

91. The hollow beam as defined in claim 90 wherein,

the slits in the first sheet of material and the slits in the second sheet of material are arcuate.

92. The hollow beam as defined in claim 89 wherein,

the first sheet of material and the second sheet of material are configured and secured together to form a cured hollow beam.

93. The hollow beam as defined in claim 89 wherein,

the first sheet of material is formed with slits positioned to extend along opposite sides of a pair of substantially parallel first sheet bend lines;

the second sheet of material is formed with slits positioned to extend along opposite sides of a pair of substantially parallel second sheet bend lines.

94. The hollow beam as defined in claim 93 wherein,

the first sheet of material includes a plurality of notches extending inwardly from opposite edges of the first sheet of material to positions proximate the pair of first sheet bend lines; and

the second sheet of material includes a plurality of notches extending inwardly from opposite edges of the second sheet of material to positions proximate the pair of second sheet bend lines.

95. The hollow beam as defined in claim 94 wherein,

the first sheet of material and the second sheet of material are each bent to have a U-shaped transverse cross section, and are secured together to form a four-sided hollow box beam.

96. The hollow beam as defined in claim 95 wherein,

the first sheet of material and the second sheet of material are bent to curve longitudinally along the bend lines, and are secured together to form a curved four-sided hollow box beam.

97. The hollow beam as defined in claim 96 wherein,

the notches in the first sheet of material and the second sheet of material are pie-shaped, and

the first sheet of material and the second sheet of material are secured together by a plurality of fasteners.

98. A cross-braced box beam comprising:

a sheet of material formed for bending along a plurality of bend lines, the sheet of material being formed with a plurality of slits therethrough positioned proximate each of the bend lines, and the slits being configured to produce bending of the sheet into a box beam with at least two cross-bracing sheet portions positioned inside the beam, when bent to a three-dimensional form, the cross bracing sheet portions extending between alternating diametrically opposed corners of the box beam.

99. A continuous corrugated deck comprising:

a sheet of material formed for bending along a plurality of bend lines, the sheet of material being formed with a plurality of slits therethrough positioned proximate each of the bend lines, and the slits being configured to produce bending of the sheet into a corrugated deck having abutting chord sheet portions along both a top and a bottom side of the deck when bent into a three-dimensional form to provide continuous deck surfaces, and a plurality of connecting web sheet portions between the chord sheet portions.

100. A chassis for support of components comprising:

a sheet of material formed for bending along a plurality of bend lines, the sheet of material being formed with a plurality of slits therethrough positioned proximate each of the bend lines, and the slits being configured to produce a chassis;

at least one component secured to the sheet; and

the sheet being bent along the bend lines to at least partially enclose the sheet.

101. A method of slitting a sheet of material for bending along a bend line comprising the step of:

forming a plurality of slits through the sheet of material which are positioned relative to the bend line and configured to produce bending along the bend line with edge-to-face engagement of the material on opposite sides of the slits upon bending of the sheet of material.

102. The method as defined in claim 101 wherein,

during the forming step, forming the slits as arcuate slits alternating on opposite sides of the bend line with convex sides of the arcuate slits closest to the bend line.

103. A method as defined in claim 101 wherein,

during the forming step, each slit is formed with slit end portions diverging away from the bend line, with a pair of longitudinally adjacent slit end portions on opposite sides of the bend line defining a bending strap extending across the bend line, and during the forming step, forming the slits with a kerf width dimensioned and transverse jog distance between slits producing interengagement of the sheet of material on opposite sides of the slits during bending.

104. The method of slitting a sheet of material for bending as defined in claim 103 wherein,

the forming step is accomplished by forming the slits with slit end portions defining a bending strap extending obliquely across the bend line.

105. The method as defined in claim 103, and

the step of varying the cross sectional area of the bending strap by changing at least one of the jog distance

between slits and the position of the slits along the bend line.

106. The method of slitting a sheet of material for bending as defined in claim 101, and the step of:

prior to the forming step, selecting a solid sheet of elastically and plastically deformable material for slitting.

107. The method of slitting a sheet of material for bending as defined in claim 101 wherein,

the forming step is accomplished by forming each of the slits in a position to longitudinally overlap along the bend line; and

forming each slit with an arcuate end portion at each end of the slit to define an obliquely extending bending strap between the end portions of longitudinally adjacent slits.

108. The method of slitting a sheet of material for bending as defined in claim 107 wherein,

the forming step is accomplished by forming the slits to be laterally offset on opposite sides of the bend line with central slip portions substantially parallel to the bend line.

109. The method of slitting a sheet of material for bending as defined in claim 108,

the forming step is accomplished by forming the slits with a kerf producing sliding of edges on one side of the slit on faces on the other side of the slit during bending to position the edges in supporting relation to the faces of the sheet of material on opposite sides of the slits during bending.

110. The method of slitting a sheet of material for bending as defined in claim 109, and the step of:

after the forming step, bending the sheet of material about a virtual fulcrum aligned with the bend line to produce plastic and elastic deformation of the bending strap.

111. The method of slitting a sheet of material for bending as defined in claim 101, wherein

the forming step is accomplished by forming a plurality of slits as defined in claim 101 on opposite sides of the bend line along substantially the full length of the bend line.

112. The method of slitting a sheet of material for bending as defined in claim 101, and the step of:

after the forming step, bending the sheet of material about the bend line.

113. The method as defined in claim 112 wherein,

during the forming step, forming a plurality of slits on each of a plurality of intersecting bend lines;

during the bending step, bending the sheet of material along at least two bend lines to produce a structure having three mutually intersecting and abutting planar sheet panels; and the step of:

securing the three mutually intersecting panels in abutting relation for mutual support.

114. The method as defined in claim 112, and the step of:

after the bending step, filling the bent sheet of material at the slits by one of a welding, brazing, soldering, potting and adhesive filling step.

115. The method of slitting a sheet of material for bending as defined in claim 101 wherein,

the forming step is accomplished at a first location, and the steps of:

after the forming step, transporting the sheet of material from the first location to a second location remote of the first location; and

after the transporting step, bending the sheet of material along the bend line at the second location.

116. The method of slitting a sheet of material for bending as defined in claim 115 wherein,

the transporting step is accomplished by transporting the sheet of material in one of:

(a) a flat condition;

(b) a coiled condition; and

(c) a partially formed condition.

117. The method of slitting a sheet of material for bending as defined in claim 115 wherein, after the forming step and

prior to the transporting step, rolling the sheet of material into a coil, performing the transporting step while the sheet of material is coiled, and the step of:

uncoiling the sheet of material at another location prior to performing the bending step.

118. The method of slitting a sheet of material for bending as defined in claim 117, and the step of:

during the uncoiling step, performing the bending step.

119. The method as defined in claim 118 wherein,

the transportation step is accomplished by transporting the coiled sheet of material from a first location on the surface of the surface of the earth to a second location in outer space.

120. The method as defined in claim 119 wherein,

the bending step is accomplished by bending the sheet of material along a plurality of bend lines to produce a structure having three mutually intersecting planes; and the step of

securing the structure against unbending.

121. A method of forming a sheet of material for bending along a bend line comprising the step of:

forming a plurality of bending strap-defining structures in the sheet of material which are positioned relative to the bend line to define at least one bending strap in the sheet of material having a longitudinal strap axis oriented to extend across the bend line, the strap-defining structures being configured and positioned with edge-to-face engagement of the material to produce bending of the sheet of material along the bend line.

122. The method as defined in claim 121 wherein,

the forming step is accomplished by forming the strap-defining structures as slits extending through the sheet of material.

123. The method as defined in claim 122 wherein,

the forming step is accomplished by forming the slits to have a kerf dimension and jog distance causing edge-to-face engagement of the sheet of material on opposite sides of the slits during bending of the sheet of material.

124. The method as defined in claim 121 wherein,
the forming step is accomplished by forming the slits as elongated arcuate slits.

125. The method as defined in claim 124 wherein,
the forming step is accomplished by forming the arcuate slits to have convex sides facing the bend line.

126. The method as defined in claim 121 wherein,
the forming step is accomplished by forming the strap-defining structures as grooves formed to a depth not extending through the sheet of material.

127. The method as defined in claim 126 wherein,
the forming step is accomplished by forming the grooves as elongated arcuate grooves.

128. The method as defined in claim 127 wherein,
the forming step is accomplished by forming the arcuate grooves to have convex sides facing the bend line.

129. The method as defined in claim 126 wherein,
the forming step is accomplished by forming the grooves in the same side of the sheet of material.

130. The method as defined in claim 121 wherein,
the forming step is accomplished by forming the strap-defining structures to define straps having a width dimension which increases in both directions along a longitudinal strap axis from about a midpoint of the length of the strap.

131. The method as defined in claim 121 wherein,

the forming step is accomplished by forming the strap-defining structures as arcuate slits defining tongues on a concave side of the arcuate slits displaced out of the plane of the sheet of material before bending.

132. The method as defined in claim 122 wherein,

during the forming step, forming the slits as arcuate slits alternating on opposite sides of the bend line with convex sides of the arcuate slits facing the bend line.

133. A method as defined in claim 121 wherein,

during the forming step, each slit is formed with slit end portions diverging away from the bend line, with a pair of longitudinally adjacent slit end portions on opposite sides of the bend line defining the bending strap extending across the bend line, and during the forming step, forming the slits with a kerf width dimensioned producing interengagement of the sheet of material on opposite sides of the slits during bending.

134. A method of slitting a sheet of material for bending along a bend line comprising the steps of:

selecting a solid sheet of material for slitting; and

forming a plurality of slits along a desired bend line with alternate slits along the bend line being positioned on alternating sides of the bend line and during the forming step, forming each slit with a central portion substantially parallel to and offset laterally from the bend line and with arcuate slit end portions on each end of the slit curving away from the bend line so that adjacent pairs of arcuate slits define bending straps extending obliquely across the bend line with increasing strap width dimensions on both sides of a minimum width dimension.

135. The method as defined in claim 134 wherein,

the forming step is accomplished using a laser cutting apparatus to cut slits having a kerf width dimensioned to produce interengagement of the sheet of material on opposite sides of the slits during bending.

136. The method in claim 134 wherein,

the forming step is accomplished using a water jet cutting apparatus to cut slits having a kerf width dimensioned to produce interengagement of the sheet of material on opposite sides of the slits during bending.

137. The method as defined in claim 134, and the step of:

after the forming step, bending the sheet of material along the bend line.

138. The method as defined in claim 137 wherein,

the forming step is accomplished by forming the slits with a kerf width dimension and a transverse jog distance between slits producing sliding interengagement of an edge of the sheet of material on one side of the slit with a face of the sheet of material on the other side of the sheet of material; and

the bending step is accomplished by bending the sheet of material about a virtual fulcrum substantially aligned with the bend line so that sliding interengagement of edges and faces of the sheet of material produces plastic and elastic deformation of the bending straps.

139. The method as defined in claim 138 wherein,

the forming step is accomplished by forming the slits along a plurality of intersecting bend lines; and

the bending step is accomplished by bending the sheet of material into a three-dimensional structure having three intersecting planar areas extending into abutting relation; and the step of

securing the three intersecting planar areas together to form a stable structure.

140. The method as defined in claim 138, and the step of:

after the bending step, filling the slits with a material producing a sealed joint at the bend line.

141. The method of claim 140 wherein,

the filling step is accomplished by one of:

(a) welding;

(b) brazing;

(c) soldering;

(d) potting; and

(e) adhesive filling.

142. The method of claim 138, and the step of:

after the bending step, unbending the sheet of material.

143. The method of claim 134 wherein,

the forming step is accomplished by providing slits defining bending straps oriented relative to the bend line to oppositely extending oblique angles.

144. The method of claim 143 wherein,

the forming step is accomplished by providing bending straps having longituding strap axes oriented relative to the bend line at angles of about 45° and about 135° at opposite ends of a slit.

145. A method as defined in claim 134 wherein,

the forming step is accomplished by selecting a width dimension for the bending straps producing a desired amount of force required to bend the sheet of material.

146. A method as set forth in claim 134 wherein,

the forming step is accomplished by selecting a minimum width dimension for the bending straps which is greater than the thickness of the sheet of material being bent.

147. A method as set forth in claim 134 wherein,

the forming step is accomplished by selecting a minimum width dimension for the bending straps which is less than the thickness of the sheet of material being bent.

148. A method as set forth in claim 134 wherein,

the forming step is accomplished by selecting a minimum width dimension for the bending straps which is in the range of about 0.5 to about 4 times the thickness of the sheet of material being bent.

149. A method as set forth in claim 148 wherein,

the selecting step is accomplished by selecting a minimum width of the bending straps to be between 0.7 to 2.5 times the thickness of the material being bent.

150. A method as set forth in claim 134 wherein,

the forming step is accomplished by configuring the bending straps to be oriented obliquely to the bending line in oppositely skewed directions.

151. A method as set forth in claim 150 wherein,

the forming step is accomplished by configuring the bending straps to diverge from proximate a midpoint of the lengths of the bending straps.

152. The method as defined in claim 134 wherein,
the steps of selecting the sheet of material and forming a plurality of slits are accomplished to produce only elastic deformation of the sheet of material during bending.

153. The method as defined in claim 134 wherein,
the forming step is accomplished in a manner producing sliding edge-to-face engagement of the sheet of material on opposite sides of the slits, the sliding engagement progressing from a longitudinal center of the slits to the slit ends as the bending straps are twisted and bent.

154. The method as defined in claim 134 wherein,
during the forming step, the minimum width of the bending straps, the distance of each slit from the bend line, and the width of each slit are selected to produce a desired strength of the bend for the composition and thickness of said sheet of material and the forces to which the bend is to be subjected during use.

155. The method of claim 134 wherein,
during the forming step, the distance of each slit to the bend line is less than the thickness of the sheet of material.

156. The method of claim 134 wherein, during the step of forming the slits, the slits are formed to have a geometry

which tends to reduce residual stress in the sheet material at the point where the slits are terminated.

157. The method as defined in claim 137 wherein,

the forming step is accomplished by forming the slits along a plurality of bend lines arranged to produce a cross-braced box beam upon bending; and

during the bending step, bending the sheet of material into a cross-braced box beam.

158. The method as defined in claim 137 wherein,

the forming step is accomplished by forming the slits along a plurality of bend lines arranged to produce a continuous corrugated deck upon bending; and

during the bending step, bending the sheet of material into a continuous corrugated deck.

159. The method as defined in claim 137 wherein,

the forming step is accomplished by forming the slits along a plurality of bend lines arranged to produce a component support chassis upon bending; and

during the bending step, bending the sheet of material into a component support chassis.

160. The method as defined in claim 137 wherein,

the forming step is accomplished by forming the slits along a plurality of bend lines arranged to produce a stud wall upon bending; and

during the bending step, bending the sheet of material into a stud wall.

161. The method as defined in claim 137 wherein,

the forming step is accomplished by forming the slits along a plurality of bend lines arranged to produce a ladder upon bending; and

during the bending step, bending the sheet of material into a ladder.

162. A method of forming a three dimensional structure comprising the steps of:

forming a plurality of bend-facilitating structures in a sheet of material, the plurality of bend-facilitating structures being configured and positioned relative to a plurality of bend lines to produce bending of the sheet of material along the bend lines;

bending the sheet of material along a first bend line;

bending the sheet of material along at least one additional bend line until two portions of the sheet of material are abutting; and

coupling together two abutting portions of the sheet of material to produce a rigid load bearing three-dimensional structure capable of supporting three-dimensional loading.

163. The method as defined in claim 162 wherein,

during said forming step, forming said bend facilitating structures as slits having a kerf producing edge-to-face contact during the bending step.

164. A method of designing a three-dimensional structure comprising the steps of:

laying out in a CAD system a plurality of bend-facilitating structures to be placed in a sheet of material, the plurality of bend-facilitating structures being configured and positioned relative to a plurality of

bend lines to allow bending of the sheet of material along the bend lines; and

forming said bend-facilitating structures in said sheet of material identically to the way said structures are laid out on said CAD system, such that when said sheet is bent along at least two bend lines two portions of said sheet will be abutting and said abutting portions may be coupled together to produce a rigid load bearing three-dimensional structure capable of supporting three-dimensional loading.

165. A method of designing a product comprising the steps of:

laying out the design of the product in two dimensions, wherein said product is to be made from a folded sheet of solid material; and

designing the configuration of and positioning for at least two slits to be formed in the sheet of solid material, with each slit to be located in a laterally offset position on opposite sides of a desired bend line and to be longitudinally displaced relative to the other slit along the bend line, the slits to be configured to produce interengagement of solid edges of said sheet of solid material on opposite sides of the slits during bending of the sheet of solid material.

166. A method of making a product comprising the steps of:

laying out the design of the product in two dimensions on a sheet of material;

designing the configuration of at least two elongated slits to be formed in the sheet of material with each slit being laterally offset on opposite sides of a desired bend line and being longitudinally displaced relative to the other slit along the bend line, the slits being configured

to produce interengagement of solid edges of the sheet of material on opposite sides of the slits during bending of the sheet of material;

forming the slits in the sheet of material as designed and positioned; and

bending the sheet of material along the bend line to form the product.

167. The method as defined in claim 166, and the additional step of:

prior to the bending step, shipping the formed sheet of material in a flat state for bending of the sheet of material at a remote location.

168. The method as defined in claim 166, and the additional step of:

bending the sheet of material at the remote location about a virtual fulcrum aligned with the bend line to produce deformation of the sheet of material along the bend line and interengagement of solid edges of the sheet of material.

169. A method of folding a sheet of isotropic material along a fold line comprising the steps of:

forming a plurality of arcs on the sheet of material, each of the arcs defining a plurality of connected zones between ends of the arcs, the arcs being symmetrically and longitudinally spaced on opposite sides of the fold line, the connected zones forming straps extending obliquely across the fold line; and

folding the sheet of material along the fold line.

170. The method as defined in claim 169 wherein,

the forming step is accomplished by forming the arcs to define straps aligned in opposite directions along the fold line so that the planes of the sheet of material on opposite sides of the fold line do not shift when the sheet of material is folded along the fold line.

171. The method as defined in claim 169 wherein,

during the forming step, forming the arcs to produce connected zones extending obliquely across the fold line in the same direction; and

during the bending step, allowing the sheet of material on opposite sides of the fold line to shift longitudinally along the fold line.

172. A sheet of material formed for bending along a bend line comprising:

a sheet of material having at least two bending straps formed to extend across the bend line, the straps having a minimum width dimension proximate the bend line and increasing in width dimension as the straps extend away from both sides of the minimum width dimension, and the straps being positioned relative to a desired bend line and being configured to produce plastic deformation of the straps at the bend line upon bending of the sheet of material along the bend line.

173. A method of bending a sheet of non-compressible material along a bend line comprising the steps of:

forming a plurality of connected arcs on said sheet, each of said arcs creating a connected zone and a disconnected zone in said sheet, wherein said arcs are symmetrically and longitudinally spaced along said bend line, wherein said connected zones form straps across said bend line, and wherein said disconnected zones have biased

tabs that remain somewhat deflected in one of a downward or upward bias from said sheet upon bending, said tabs assisting in correctly initiating edge to face engagement of said disconnected zones throughout the length of said bend line upon bending; and

bending said sheet along said bend line such that a plane of said sheet shifts relative to said another plane of said sheet along said bend line.

174. A method as set forth in claim 173 wherein said deflected bias of said tabs prevents said tabs from sliding under or over the opposite face of said sheet thereby preserving the integrity of said bending process.

175. A method as set forth in claim 174 wherein said bending occurs in the opposite direction from said deflected biased tabs.

176. A method of preparing a sheet of material that is only elastically deformable for bending along a bend line comprising the step of: forming a plurality of connected large radius arcs on said sheet, each of said arcs creating a connected zone and a disconnected zone in said sheet, wherein said arcs are symmetrically and longitudinally spaced along said bend line and wherein said connected zones form straps across said bend line and wherein said bend line terminates at a free surface comprising one of an exterior edge and an interior edge.

177. The method of claim 176 wherein said free surface is an exterior edge wherein said bend terminates in one of:

a. an exterior edge at or near a perpendicular edge with respect to said bend line;

b. an interruption of a disconnected zone across said bend line near a bend edge with a strap between said interruption and said bend edge with said bend perpendicular or nearly perpendicular to said bend line;

c. a significantly non-perpendicular angle to said bend line where the angle of a bend line is used as one edge of a terminating strap;

d. an exterior bend edge of a strap is near a radius corner, where said last arc is rotated so as to form said strap at said bend edge; and

e. a terminal arc rotated to the other side of said bend line so as to coincide with the curvature of a radius corner and thus form a final strap of said bend.

178. A method of precisely bending a non-compressible sheet of material comprising the step of:

bending said sheet in a manner such that upon bending said sheet to a given degree of sharpness in the bend, the microstructure of said material undergoes very little change in comparison to bending said sheet of material to substantially the same degree of sharpness using conventional bending techniques.

179. A method of precisely bending a non-compressible sheet of material comprising the step of:

bending said sheet in a manner such that upon bending said sheet to a given angle of sharpness in the bend, the microstructure of said material undergoes very little change in comparison to bending said sheet of material to substantially the same angle of sharpness using conventional bending techniques.

180. A method of designing a part made of non-compressible sheet of material for bending along a bend line, comprising the step of:

laying out at least two bending straps in spaced apart and oblique relation along a proposed bend line in said sheet of material such that said sheet of material will be plastically deformed by both twisting and bending upon bending of said sheet of material, whereby the bending is made easier and the material is strengthened along the bend line.

181. A method of making a machine comprising the steps of:

making at least one component of the machine, where that component is made from an elastically and plastically deformable solid sheet of material by a method comprising the steps of:

a. forming two elongated slits through the sheet of material with each slit being laterally offset on opposite sides of a desired bend line and being longitudinally displaced relative to the other slit along said bend line, said slits having a kerf width dimension producing interengagement of solid edges of said sheet of material on opposite sides of said slits during bending; and

b. bending said sheet of material about a virtual fulcrum aligned with said bend line to produce plastic and elastic deformation of said sheet of material along said bend line and interengagement of said solid edges; and

assembling all components necessary to finish making the machine.

182. A method of designing a product comprising the steps of:

laying out the design of the product in two dimensions, wherein said product is made of an elastically and plastically deformable solid sheet of material; and

designing at least two elongated slits in the sheet of material with each slit being laterally offset on opposite sides of a desired bend line and being longitudinally displaced relative to the other slit along said bend line, said slits having a kerf width dimensioned producing interengagement of solid edges of said sheet of material on opposite sides of said slits during bending of said sheet of material.

183. A method of designing an enclosure comprising the steps of:

1) laying out the design of said enclosure in two dimensions, wherein said enclosure is made of an elastically and plastically deformable solid sheet of material;

2) forming at least two elongated slits in the sheet of material with each slit being laterally offset on opposite sides of a desired bend line and being longitudinally displaced relative to the other slit along said bend line, said slits having a kerf width and jog distance dimensioned producing interengagement of solid edges of said sheet of material on opposite sides of said slits during bending; and

3) repeating step 2 as many times as necessary for the number of bends contained in said enclosure.

184. A method of making an enclosure from an elastically and plastically deformable solid sheet of material comprising the steps of:

1) forming at least two elongated slits through the sheet of material with each slit being laterally offset on opposite sides of a desired bend line and being longitudinally displaced relative to the other slit along said bend line, said slits having a kerf width and jog distance dimension producing interengagement of solid edges of said sheet of material on opposite sides of said slits during bending;

2) repeating step 1) as many times as necessary for the number of bends contained in said enclosure; and

3) bending said sheet of material about each virtual fulcrum aligned with each of said bend lines to produce plastic and elastic deformation of said sheet of material along each of said bend lines and interengagement of said solid edges.

185. A method as in claim 5 wherein an additional step comprises:

sealing the enclosure so that it permanently conforms to the finished shape of said enclosure.

186. A method of making a part made of a non-compressible sheet of material for bending along a bend line, comprising the step of:

creating at least two bending straps in spaced apart and oblique relation along a proposed bend line in said sheet of material such that said sheet of material will be plastically deformed by both twisting and bending upon bending of said sheet of material, whereby the bending is made easier and the material is strengthened along the bend line.

187. A sheet of material formed for bending along a bend line comprising:

a sheet material which is elastically deformable having a plurality of slits each comprised of a plurality of longitudinally connected arcs on the sheet, each slit being configured and positioned relative to a desired fold line to produce a connected zone and a disconnected zone in the sheet wherein the slits are symmetrically and longitudinally spaced along the fold line and wherein the connected zones have a relatively small angle from the fold line.

188. A sheet of material formed for bending along a bend line comprising:

a sheet of material having a slit formed therethrough and positioned proximate a desired bend line, and a bending strap at each end of the slit, the bending strap being configured to produce bending of the sheet of material along the bend line with edge-to-face engagement of the sheet of material on opposite sides of the slit during substantially the entire bend of the sheet of material.

189. The sheet of material as defined in claim 188 wherein,

the slit has slit end portions diverging away from the bend line and defining one side of each bending strap.

190. The sheet of material as defined in claim 189 wherein,

the slit end portions are arcuate and curve away from the bend line.

191. The sheet of material as defined in claim 188 wherein,

the bending straps extend obliquely across the bend line.

192. The sheet of material as defined in claim 191 wherein,

the bending straps are skewed in opposed directions converging toward each other on a side of the bend line opposite the slit.

193. The sheet of material as defined in claim 188 wherein,

a side of one bending strap is defined by an edge of the sheet of material.

194. The sheet of material as defined in claim 193 wherein,

the slit has arcuate end portion at each end and one end portion and the edge of the sheet of material define an obliquely extending bending strap.

195. The sheet of material as defined in claim 188 wherein,

the sheet of material has been bent along the bend line.

196. A method of bending a sheet of material formed for bending along a bend line comprising the step of:

forming a slit through a sheet of material, said slit being positioned relative to a desired bend line and being configured to produce bending of the sheet of material along the bend line with edge-to-face engagement of the sheet of material on opposite sides of the slit during substantially the entire bend of the sheet of material.

197. The method of claim 196 wherein,

the forming step is accomplished by forming said slit having end portions, each of said end portions defining one side of a bending strap extending obliquely across the bend line.

198. The method of claim 197 wherein,

said slit is arcuate with a convex side, said convex side of said slit being closest to the bend line.

199. The method of claim 196 wherein,

the forming step is accomplished by forming the slit proximate an edge of the sheet of material so that the edge and an arcuate end of the sheet of material define a bending strap.

200. A method of designing a sheet of material for bending along a bend line comprising the step of:

laying out a slit on a sheet of material, said slit being positioned relative to a desired bend line and configured to define with a structure on the sheet, a bending strap at each end of the slit oriented to produce edge-to-face engagement of the sheet of material on opposite sides of a slit upon bending of the sheet of material during substantially the entire bend of the sheet of material.

201. The method of claim 200 wherein,

the laying out step is accomplished by forming said slit having end portions, each of said end portions defining a bending strap that extends obliquely across the bend line in oppositely skewed directions that converge on a far side of the bend line from the slit.

202. The method of claim 201 wherein,

the forming step is accomplished by forming the slit as an arcuate slit with a convex side being positioned closest to the bend line.

203. A method of forming a sheet of material for bending along a bend line comprising the step of:

forming a plurality of bending strap-defining structures in the sheet of material which are positioned relative to the bend line to define at two bending straps in the sheet of material at opposite ends of a slit through the sheet of material, the bending straps each having a longitudinal strap axis oriented to extend across the bend line, the strap-defining structures being configured and positioned relative to the slit to produce edge-to-face engagement of the material on opposite sides of the slit during bending of the sheet of material.

204. A method of slitting a sheet of material for bending along a bend line comprising the steps of:

selecting a solid sheet of material for slitting; and

forming a slit along a desired bend line with a central portion substantially parallel to and offset laterally from the bend line and with arcuate slit end portions on each end of said slit curving away from the bend line so that said end portions of said arcuate slit define at least part of bending straps extending obliquely across the bend line with increasing strap width dimensions on both sides of a minimum width dimension of the straps.

205. A method of designing a product comprising the steps of:

laying out the design of the product in two dimensions, wherein said product is to be made from a folded sheet of solid material; and

designing the configuration of and positioning a slit to be formed in the sheet of solid material, said slit to be located in a laterally offset position along a desired bend line, said slit to be configured to produce interengagement of solid edges of said sheet of solid material on opposite sides of said slit during bending of the sheet of solid material.

206. A method of designing a non-compressible sheet of material to be bent along a bend line comprising the step of:

laying out a slit and a bending strap on each end of the slit on the sheet in a manner such that upon bending the sheet to a given angle of sharpness in the bend, the microstructure of the sheet of material undergoes very little change in comparison to bending the sheet of material to substantially the same angle of sharpness using conventional bending techniques.

207. The method as defined in claim 206 and the step of:

forming the sheet with the slit and bending straps; and

bending the sheet along the bend line.

208. A method of designing a product comprising the steps of:

laying out the design of the product in two dimensions, wherein said product is to be made from a folded sheet of solid material; and

designing the configuration of and positioning a slit to be formed in the sheet of solid material, said slit to

be located in a laterally offset position along a desired bend line, said slit to be configured to produce interengagement of solid edges of said sheet of solid material on opposite sides of said slit during bending of the sheet of solid material.